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EDITORIAL.

Cultivation and Manuring of Coconuts.

A series of experiments, conducted on six estates, to investigate the problems of cultivation and manuring of coconuts has been continued for a period of six years. The yield records in 1936 are given in a summary of results which is included in the present number. These records confirm the conclusions reached in previous years, and which were thus stated in an editorial on this work:—

> "Although exceptions may be found, it is shewn that on normal soils in Malaya, with palms between 10 and 21 years of age, neither manuring nor liming of coconut areas will prove economical. The most satisfactory system would appear to be to supply the area with a cover which is periodically cut and to concentrate attention on adequate drainage".

The results published in this number carry the investigation a step further, for whereas previous records proved that there was no significant or economic response either to manures, lime or to surface treatments, the present account shews that there is as yet no delayed action from the treatments carried out from 1931 to the middle of 1934. The yields in 1936 therefore fully confirm the opinions expressed in the previous report.

Investigations on Tuba Root.

Tuba root (*Derris* spp.) has in recent years attracted increasing attention on account of its value for insecticidal purposes. Previously it was grown on a small scale in market gardens, or as a catch crop with more permanent forms of cultivation. Now that its value is more widely appreciated it has been planted on a relatively large scale as a sole crop.

The facts that derris is taking its place in the world's markets, and that it is now considered as an estate product, emphasized the desirability of establishing high-grade planting material. One of the most serious criticisms of the market in the past has been the wide variations in toxicity of different consignments. It is possible that many of the earlier complaints of adulteration were not in fact true, but were due to the growing of inferior types.

In recent years investigations in Malaya and in the Netherlands Indies have resulted in a considerable improvement in the quality of exports. The basis of this work has been chemical analysis of the roots to determine the toxicity as measured either by rotenone content or by the ether extract. The investigators have endeavoured to elucidate the causes of variations in toxicity. Broadly speaking, the following facts have so far resulted from this work.

(*a*) Toxicity varies according to species and we now know the species which are inherently more valuable.

(*b*) Old woody roots are of less value than the smaller roots; in consequence, the planter now has a much better idea of the age at which the plants should be harvested.

(*c*) Certain types of derris grow more vigorously, are more toxic, and are less prone to insect attack than are other types. Consequently, further investigation of types is in progress from which it is hoped to establish particularly satisfactory clones.

(*d*) Present indications are that variation in toxicity with any type is an inherent character, and within limits, therefore, a type will give the same results, as regards toxicity, irrespective of the soil in which it is grown or of differences in climate.

The subject of variations in the rotenone content and ether extract of roots of some races of *Derris elliptica* is discussed in an article in this number. The authors describe the experiments which they carried out with the object of isolating desirable races of this species, three races known as "Changi" and two of "Singapore" being the material on which the work was done; attention is also directed to the merits of the "Sarawak creeping" form.

The commercial possibilities of this work are pointed out by the authors who state, as a result of the present experiments:—

> "Provided toxicity is an inherent character, the gradual substitution of Changi No. 3 for Changi No. 1 and Changi No. 2 would result in the present Singapore standard being raised by approximately 40 per cent. in respect of rotenone and 25 per cent. in respect of ether extract".

Original Articles.

EXPERIMENTS ON THE CULTIVATION AND MANURING OF COCONUTS IN MALAYA

(Summary of Results to December, 1936).

BY
W. N. C. BELGRAVE,
Chief Research Officer
and
J. LAMBOURNE,
Assistant Agriculturist.

Introduction.

The cultivation and manurial experiments on coconuts have been described and the results to the end of 1934 published in previous issues of this Journal (1, 2 & 3).

The lay-out has been described and consists of sixteen plots of sixteen palms each for testing the four cultivation treatments: (a) cover slashed every three months, (b) cover buried to a depth of seven inches twice a year, (c) clean weeding with cultivation to a depth of seven inches twice a year, and (d) clean weeding without cultivation. Each plot is divided into four sub-plots of four palms each which are treated as follows: (i) a complete manurial mixture consisting of whale guano 2½ lbs., steamed bone meal 4 lbs., and muriate of potash 1½ lbs. per palm, which for convenience and brevity is designed NPK; (ii) the complete mixture as in (i) with lime at the rate of 10 piculs per acre (LNPK); (iii) lime alone at the same rate as in (ii); and (iv) control.

The manures and lime were applied in the first quarter of 1931 and again in 1932, while Estate A received three dressings (August, 1930, 1931 and 1932). From June, 1934, to the end of 1935, treatments and recording were suspended on Estates A, and C to G. Estate B received treatment and will be dealt with separately.

Treatments were discontinued, but records were taken for six months during 1936 on Estates A, and C to G in order to test for possible delayed action from the treatments. The results are summarized in Table I, and comparison of these figures with those in Table IV, *Malayan Agricultural Journal*, November, 1934, pp. 521-527, shows that there are no indications of significant or economic response to the manurial or cultivation treatments over one, two, or four year periods on normal estates.

Table I.

Results of Nut Counts.

	Cover Slashed	Cover Buried	Clean & Culti-vated	Clean	NPK	LNPK	Lime	Control	Mean
Estate A Percentage of mean	109	93	99	98	98	111	99	93	24.7
Apr.-Sept. 1936 Nuts per palm	*27*	*23*	*24*	*24*	*24*	*27*	*24*	*23*	
Estate C Percentage of mean	100	98	104	98	102	94	104	99	47
Apr.-Sept. 1936 Nuts per palm	*47*	*46*	*49*	*46*	*48*	*44*	*49*	*47*	
Estate D Percentage of mean	97	101	99	102	97	99	99	105	44
Dec. 1935-June, 1936 Nuts per palm	*43*	*45*	*44*	*45*	*43*	*43*	*43*	*46*	(7 months)
Estate E Percentage of mean	101	85	110	103	94	98	95	112	30
Apr.-Sept. 1936 Nuts per palm	*31*	*26*	*34*	*31*	*29*	*30*	*29*	*34*	
Estate F Percentage of mean	105	97	102	96	98	102	105	95	29
Apr.-Sept. 1936 Nuts per palm	*31*	*28*	*30*	*28*	*29*	*30*	*31*	*28*	
Estate G Percentage of mean	98	103	104	96	89	99	106	105	35
Apr.-Sept. 1936 Nuts per palm	*35*	*36*	*37*	*34*	*31*	*35*	*37*	*37*	

Table II - Estate B.

Results in Nuts per Palm since Experiment Commenced.

		Cover Slashed	Cover Buried	Culti-vated	Clean	NPK	LNPK	Lime	Control	Mean	LNPK cultivated
1931	Percentage of general mean ...	87	118	98	97	87	99	89	127		148
	Nuts per palm ...	*11*	*15*	*13*	*13*	*11*	*13*	*11*	*17*	*13*	*19*
1932	Percentage of general mean ..	86	87	133	95	97	111	91	101		191
	Nuts per palm ...	*20*	*20*	*31*	*22*	*23*	*27*	*21*	*24*	*23*	*45*
1933	Percentage of general mean ...	55	80	136	129	89	120	99	92		182
	Nuts per palm ...	*21*	*30*	*52*	*49*	*34*	*46*	*38*	*35*	*38*	*69*
1934	Percentage of general mean	84	79	130	107	94	115	94	97		184
	Nuts per palm ...	*10*	*9*	*15*	*13*	*11*	*14*	*11*	*11*	*12*	*22*
1935	Percentage of general mean ...	81	65	133	120	80	138	98	85		241
	Nuts per palm ...	*15*	*12*	*24*	*22*	*15*	*25*	*18*	*16*	*18*	*44*
1936	Percentage of general mean ...	64	94	127	115	74	137	94	93		242
	Nuts per palm ...	*8*	*12*	*16*	*14*	*9*	*17*	*12*	*12*	*12*	*29*
	Percentage of the mean ...	79	84	132	116	89	126	100	100	—	190
	Mean annual yield in nuts per palm over 6 years ...	*14*	*16*	*25*	*22*	*17*	*24*	*19*	*19*	*19*	*36*

Table III.

Half-yearly Yield in Nuts per Plot of 16 Palms.

	Cover Slashed	Cover Buried	Culti-vated	Clean	NPK	LNPK	L.	O.	Mean	Cultivated				LNPK			
										NPK	LNPK	Lime	O.	Slashed	Buried	Culti-vated	Clean
1933 (A)	210	301	529	469	346	462	360	341	377	495	722	363	535	303	272	722	550
1933 (B)	125	186	297	318	194	269	241	222	232	186	387	309	307	150	173	387	367
1934 (A)	79	86	143	130	107	128	102	101	109	116	206	107	141	109	85	206	112
1934 (B)	80	63	104	72	71	89	76	82	80	102	141	80	91	90	41	141	83
1935 (A)	94	72	167	141	104	141	126	103	118	173	266	85	145	100	38	266	159
1935 (B)	143	121	225	213	131	264	161	146	175	165	443	123	168	234	74	443	304
1936 (A)	98	156	200	177	112	224	152	142	157	109	374	116	202	118	145	374	258
1936 (B)	29	36	50	50	35	48	34	44	40	21	95	34	51	30	18	95	50

(A) = January—June.
(B) = July—December.

Estate C — General Mean
1933 (A) = 814
(B) = 895
1934 (A) = 660
1936 (A) = *752*

Size of Nuts.

The mean weights per nut from plots under different treatments are given in Table IV, and these figures show that treatments have had no significant effect upon the size of nut. This result confirms previous records (see Table IV, *Malayan Agricultural Journal*, November, 1934). The greatest increase over the general mean is 11 per cent., but that applies to one case only, namely Estate C—cover slashed. On the other estates the greatest increase over the general mean ranges between 2 and 7 per cent.

Table IV.

Mean Weight per Nut in pounds.

Estate	Slashed	Buried	Cultivated	Clean	General Mean	NPK	LNPK	Lime	Control
A ...	2.66	2.63	2.51	2.50	2.58	2.55	2.59	2.70	2.47
B ...	1.98	2.12	2.19	2.05	2.09	2.10	2.08	2.28	1.90
C ...	2.37	2.06	2.10	2.14	2.14	2.07	2.15	2.11	2.21
D ...	2.45	2.26	2.25	2.19	2.28	2.27	2.31	2.34	2.21
E ...	2.39	2.38	2.41	2.29	2.37	2.33	2.30	2.39	2.43
F ...	2.41	2.12	2.35	2.25	2.29	2.23	2.40	2.30	2.20
G ...	2.89	2.84	3.00	2.76	2.87	2.81	2.98	2.90	2.80

Estate B.

In February, 1935, the plots on Estate B were given further manurial treatment as follows: (a) lime at the rate of ten piculs per acre was again applied to the plots which received lime in 1931; (b) lime at the same rate as (a) together with calcium cyanamide 1 lb., rock phosphate dust 3 lbs. and sulphate of potash 1 lb. per palm was applied to the LNPK plots; (c) the same NPK mixture at the same rate as in (b) was applied to the NPK plots; and (d) control. Cultivation treatments have been carried out as on the other estates.

It should be noted that the experimental plots on this estate are laid out in areas of very old palms and that the soil is a poor sandy loam.

Table II gives a summary of the results in nuts per palm and percentages of the means since the commencement of the experiment in 1931. In Table III will be found the half-yearly yields in nuts per plot irrespective of the number of palms per plot. These figures show that the cumulative effect of cultivation or clean weeding combined with lime and NPK persists, but the yields of nuts

Table V.

Yield from Estate B in Piculs of Copra per acre per annum (calculated at 250 nuts per picul), together with Value of Increases and Average Cost of Treatments per acre per annum.

	Cover Slashed	Cover Buried	Cultivated and Clean-weeded	Clean-weeded
NPK				
Yields in 1931 ...	2.53	2.15	1.49	2.51
Average annual yield, 1931-36 ...	2.81	2.16	4.00	4.19
Difference ...	+ 0.28	+ 0.01	+ 2.51	+ 1.68
Percentage increase over 1931 ...	11	—	168	67
Value of increase @ $5 per picul ...	$ 1.40	$ 0.05	$12.55	$ 8.40
„ „ @ $9 „ ...	$ 2.51	$ 0.09	$22.59	$15.12
Average annual cost of treatments ...	$15.24	$28.04	$30.04	$20.54
LNPK				
Yields in 1931 ...	2.71	1.37	3.71	2.34
Average annual yield, 1931-36 ...	3.44	2.31	7.31	4.90
Difference ...	+ 0.73	+ 0.94	+ 3.60	+ 2.56
Percentage increase over 1931 ...	27	69	97	114
Value of increase @ $5 per picul ...	$ 3.65	$ 4.70	$18.00	$12.80
„ „ @ $9 „ ...	$ 6.57	$ 8.46	$32.40	$23.04
Average annual cost of treatments ...	$19.09	$31.89	$33.89	$24.39
L				
Yields in 1931 ...	1.28	3.91	1.57	1.60
Average annual yield, 1931-36 ...	2.11	4.66	3.32	4.11
Difference ...	+ 0.81	+ 0.65	+ 1.75	+ 2.51
Percentage increase over 1931 ...	65	19	111	157
Value of increase @ $5 per picul ...	$ 4.15	$ 3.25	$ 8.75	$12.55
„ „ @ $9 „ ...	$ 7.47	$ 5.95	$15.05	$22.59
Average annual cost of treatments ...	$11.05	$23.85	$25.85	$16.35
CONTROL				
Yields in 1931 ...	1.85	4.50	3.16	3.28
Average annual yield, 1931-36 ...	2.50	3.59	4.37	3.78
Difference ...	+ 0.75	— 0.91	+ 1.21	+ 0.50
Percentage increase over 1931 ...	35	—	38	15
Value of increase @ $5 per picul ...	$ 3.75	—	$ 6.05	$ 2.50
„ „ @ $9 „ ...	$ 6.75	—	$10.89	$ 4.50
Average annual cost of treatments ...	$ 7.20	$20.00	$22.00	$12.50

remain low compared with normal estates. It should be noted that there was a general rise in yields in all plots from 1931 to 1933, but in 1934 there was a drop to the 1931 level with a rise in 1935 and a falling off again in 1936. The percentage of the general mean, however, has remained fairly constant in the cultivated clean weeded plots since the rise in yields in 1932. The same applies to the cultivated plus LNPK plots up to 1934 but, in 1935, the yields in these plots rose to 241 per cent. of the general mean, and this increase has been maintained in 1936, although a smaller number of nuts per palm was produced.

Economic Effect of Treatments on Estate B.

Table V gives the yields for 1931 calculated in piculs of copra per acre compared with the average over the six years, together with the differences due to treatments. These figures have been worked out at 250 nuts per picul of copra. The values of the differences have been calculated at $5 per picul, the approximate average market price over the past six years, and at $9 per picul to approximate to present prices (January, 1937). The costs of the treatments are based on figures obtained from the manager of the estate and on the market prices of manures. No allowance has been made for cost of supervision or other overhead charges.

Although significant increases in yield have resulted from cultivation and clean weeding combined with lime and the complete mixture, the value of these increases is too small to pay for the cost of the treatments with copra at $5 or $9 per picul.

Summary.

1. An account is given of records from six coconut estates taken over six months in 1936. These were taken in order to test whether there was any delayed action from the treatments carried out from 1931 to the middle of 1934.

2. It is shown that on these estates there has been no significant or economic response either to manures, lime or to surface treatments.

3. Nut weights were also recorded on two occasions in 1936 and these figures show that treatments have had no significant effect upon the size of nut.

4. On Estate B, situated on a poor light soil, there have been large responses to cultivation and clean weeding and to the application of lime and manures, but owing to the heavy drop in yield in the first half of 1934 no definite conclusions could be drawn.

5. Lime and a different complete mixture of manures were applied again early in 1935 and although the response to treatments mentioned in para. 4 still persists the yields have not again reached the 1933 level. There was a considerable rise in yield in 1935, but this was not maintained in 1936.

6. Although certain treatments on Estate B have given a large percentage increase in yield, these increases, due to the poor yields obtained from the experimental plots on this estate, are not large enough to pay for the cost of treatments.

Acknowledgments.

Thanks are due to Mr. T. D. Marsh for supervising the experiments during the latter part of 1934 and the first half of 1935, also to Che Shafie, Malay Agricultural Assistant, for taking the records.

The workers also desire to express their thanks to the agents and managers of the estates on which experiments have been conducted for permission to conduct them and for help freely given.

References.

1. Experiments on the Manuring of Coconuts and Oil Palms, compiled from Department Records, *Malayan Agricultural Journal*, Vol. XX, 1932, p. 105.
2. Manuring Experiments with Coconuts and Oil Palms, W. N. C. Belgrave and J. Lambourne, *Malayan Agricultural Journal*, Vol. XXI, 1933, p. 206.
3. Experiments on the Cultivation and Manuring of Coconuts in Malaya, W. N. C. Belgrave and J. Lambourne, *Malayan Agricultural Journal*, Vol. XXII, 1934, p. 511.

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VARIATIONS IN TOXICITY OF SOME RACES OF *DERRIS ELLIPTICA*

BY
C. D. V. GEORGI,
Agricultural Chemist
J. LAMBOURNE,
Assistant Agriculturist
and
GUNN LAY TEIK,
Assistant Analyst.

Introductory.

One of the more important problems now confronting the derris industry is the necessity for a close study of the two species cultivated at present in Malaya—*Derris elliptica* and *D. malaccensis*—with a view to developing types with roots of high toxicity. The development of such types will assist materially in eliminating the variability in quality which has been one of the principal factors affecting adversely the use of the root for insecticidal purposes.

While correct comparative evaluations of toxicity can be obtained only as a result of controlled experiments with different classes of insects, chemical tests constitute the means by which commercial consignments of roots are at present valued. Thus, the rotenone content and/or the ether extract of the root are used invariably as a basis for valuation purposes. In the case of this paper, therefore, the term "toxicity" should be regarded from the chemical aspect.

An account of some preliminary selection experiments on the lines indicated above has already been published in this Journal (1). The present paper describes further experiments carried out with the object of isolating desirable types of *D. elliptica.*

Selection of Original Planting Material.

Previous work carried out in this Department has shown a particularly wide variation to exist between the toxicities of root of *D. elliptica* from different parts of the country. Thus, for example, marketable roots of this species as established originally at the Central Experiment Station, Serdang, were found to contain only approximately 8 per cent. ether extract with 1.5 per cent. rotenone, compared with 20 per cent. ether extract and 6 per cent. rotenone for similar material from Singapore.

The existence of this wide variation in toxicity was a disconcerting factor when considering the question of increasing stocks of planting material for large scale cultivation, since it was not known to what extent toxicity might be influenced by environment.

An account of some preliminary work on these lines has already been published in this Journal (2). The results of the investigation showed, however, that toxicity was unlikely to be affected at any rate, to any marked extent, by a change of environment; that is, a poor quality root tended to remain poor and *vice versa*. Arrangements were made accordingly to obtain supplies of planting material from Singapore.

The only method of proving material is by a comparison of the results of chemical analyses of the roots of the parent plants with those for successive generations.

A further complication arises, however, in that previous work has shown the toxicity of the root to vary with the age of plant and to reach a maximum at approximately 24 months (3) (4). Unless, therefore, the ages of the parent plants are known accurately and the plants from successive generations are lifted at these same ages the figures for toxicity do not admit of comparison.

Under the circumstances, therefore, the only method was to select cuttings from plants over a wide area and to carry out analyses of roots of the individual plants when the latter had reached maturity, say 24 months.

It was considered that useful information could be obtained if the selection of cuttings was based on the differences in leaf characters and habit of growth of plants in the field. These differences were observed originally by Mr. M. R. Henderson, Curator, Botanic Gardens, Singapore, who published a detailed account of his work in this Journal (5).

Reference to the paper will show that it was possible to divide with a moderate degree of certainty a mixed population of plants in the field into fairly well-defined roots based on the above differences. As a result of the work certain distinct races or forms were described.

It cannot be emphasized too clearly that this is an arbitrary classification and these races or forms are merely based on the results of examination of a large number of plants of unknown origin and apply only so far as the above-mentioned differences are concerned.

In view, however, of the particularly wide variation in toxicity existing in this species it was considered, as stated previously, that useful information might well result by attempting to correlate the toxicities of the roots with the results of the above classification.

Accordingly, supplies of cuttings of the following races of *D. elliptica* were obtained from Singapore with the kind assistance of Mr. Henderson, and established both at the Central Experiment Station, Serdang, and at the Experimental Station, Kuala Lumpur:—(a) Changi No. 1, (b) Changi No. 2, (c) Changi No. 3, (d) Singapore No. 1, and (e) Singapore No. 2.

An account of the general experimental work, together with details for each race, will be given. Comparisons will then be drawn between the different races.

Outline of Experimental Work.

Apart from a few plants of *D. elliptica*, Changi No. 3, obtained from Singapore and to which reference will be made later, all the plants were between 23 and 24 months old when harvested. In harvesting, the whole of the root system was lifted. The stems of each plant were removed and reserved for the purpose of striking cuttings.

The roots were washed free from adhering soil and dried, and the "fine" or marketable roots were separated and weighed. The moisture content of these roots was approximately 8 per cent.

Analysis comprised the determination of both rotenone and ether extract. The methods used were those described in a previous number of this Journal (6). The results have been calculated on a moisture-free basis to the nearest 0.05 per cent.

As far as a comparison between the different races is concerned, only the figures for those analyses in which there was sufficient material for the estimation of both rotenone and ether extract have been included in the tables.

Details for Individual Races.

(a) *Derris elliptica, Changi No. 1.*

Plots of this race were established at both Serdang and Kuala Lumpur.

Growth was poor in both cases. Further, the plants appeared to be liable to depredations by leaf-eating insects, necessitating frequent applications of insecticidal preparations.

Twenty-two plants were harvested at Kuala Lumpur, twenty at Serdang.

The weights of marketable roots for the individual plants varied from 7.60 to 0.70 ozs. with an average of 2.10 ozs.

The results of analysis, which are given in Table I, indicate wide variations in respect of both rotenone and ether extract, thereby confirming the figures previously reported for roots of this race obtained with individual plants from Changi (1).

The rotenone varies from 9.10 to 2.00 per cent. with an average of 5.80 per cent., the ether extract from 28.25 to 9.00 per cent. with an average of 21.30 per cent.

There are also wide variations in the proportion of rotenone to ether extract, the figures ranging from 34.9 to 16.5 per cent. with an average of 27.0 per cent.

(b) *Derris elliptica, Changi No. 2.*

Plots of this race were established at both Serdang and Kuala Lumpur.

Similarly to Changi No. 1, great difficulty was experienced in establishing the plants, which also suffered severely from attacks by leaf-eating insects.

Sixteen plants were harvested at Kuala Lumpur, but in the case of the plot at Serdang none of the plants yielded sufficient root to carry out determinations of both rotenone and ether extract.

The weights of marketable roots for the individual plants varied from 12.50 to 0.70 ozs. with an average of 4.05 ozs.

The results of analysis, which are shown in Table II, indicate a slightly narrower range of variation in respect of both rotenone and ether extract. The range is also less than that previously recorded for this race (1).

Table I.

Derris elliptica, Changi No. 1.

Relationship between Rotenone Content and Ether Extract of Roots.

Location and Serial No. of Plant	Rotenone (moisture-free basis)	Ether Extract (moisture-free basis)	Proportion of Rotenone to Ether Extract
	per cent.	per cent.	per cent.
SERDANG			
2 ...	3.25	17.20	18.9
7 ...	7.45	27.25	27.4
8 ...	7.55	25.40	29.7
9 ...	2.95	14.25	20.8
10 ...	6.75	22.85	29.5
11 ...	4.35	26.40	16.5
12 ...	8.40	25.60	32.8
13 ...	6.75	28.25	23.9
14 ...	7.70	24.70	31.2
16 ...	6.80	24.00	28.4
17 ...	9.10	26.00	34.9
19 ...	6.80	23.10	29.4
20 ...	7.40	25.85	28.6
KUALA LUMPUR			
1 ...	5.95	20.30	29.2
2 ...	5.80	20.40	28.4
3 ...	3.65	13.45	27.0
4 ...	4.75	16.40	29.1
5 ...	5.25	16.90	31.1
6 ...	2.40	11.10	21.5
7 ...	7.25	21.20	34.2
8 ...	6.50	20.70	31.5
9 ...	5.90	23.80	24.8
10 ...	5.30	22.20	23.7
11 ...	4.70	22.80	20.6
13 ...	4.65	18.20	25.6
14 ...	5.05	20.75	24.3
15 ...	5.95	22.30	26.7
18 ...	2.00	9.00	22.2
19 ...	5.80	19.70	29.4
21 ...	6.30	24.95	25.3
22 ...	8.20	25.40	32.4
Average (for all plants)	5.80	21.30	27.0

Table II.

Derris elliptica, Changi No. 2.

Relationship between Rotenone Content and Ether Extract of Roots.

Location and Serial No. of Plant	Rotenone (moisture-free basis)	Ether Extract (moisture-free basis)	Proportion of Rotenone to Ether Extract
	per cent.	per cent.	per cent.
KUALA LUMPUR			
1 ...	6.65	22.70	29.3
2 ...	5.95	18.60	32.1
3 ...	6.95	22.05	31.6
4 ...	8.45	23.10	36.5
5 ...	8.35	24.15	34.6
6 ...	8.00	26.90	29.8
7 ...	6.20	22.45	27.6
8 ...	7.10	23.45	30.2
9 ...	5.75	22.20	26.0
10 ...	5.80	19.60	29.7
11 ...	6.10	21.85	28.0
12 ...	6.05	20.20	29.9
13 ...	6.05	19.90	30.3
14 ...	5.40	20.50	26.5
15 ...	6.95	23.40	29.7
16 ...	6.20	21.35	29.0
Average (for all plants)	6.60	22.05	30.0

The rotenone varies from 8.45 to 5.40 per cent., with an average of 6.60 per cent., the ether extract from 26.90 to 18.60 per cent. with an average of 22.05 per cent.

The proportion of rotenone to ether extract varies from 36.5 to 26.0 per cent. with an average of 30.0 per cent.

(c) *Derris elliptica, Changi No. 3.*

Plots of this race were established at both Serdang and Kuala Lumpur.

Compared with Changi No. 1 and Changi No. 2 the plants were strong and vigorous in growth; they were also remarkably free from attacks by insect pests.

In view of the size of the plots a system of random sampling was adopted in both places, eighty plants being selected at Serdang and seven at Kuala Lumpur.

The weights of marketable roots for individual plants varied from 13.40 to 0.90 ozs. with an average of 5.10 ozs. Table III in which the figures are divided into groups of 1 oz. of marketable root affords an indication of the frequency of variation.

The rotenone varied from 13.00 to 6.05 per cent., with an average of 9.20 per cent., the ether extract from 31.30 to 20.45 per cent. with an average of 26.75 per cent.

The proportion of rotenone to ether extract varied from 43.3 to 27.6 per cent. with an average of 34.0 per cent.

Table III.

Derris elliptica, Changi No. 3.

Weights of Marketable Root from Individual Plants at Serdang and Kuala Lumpur arranged in Groups of 1 ounce.

Marketable Root (air-dry basis)	No. of Samples.
ounces	
14—13	1
13—12	1
12—11	1
11—10	1
10— 9	1
9— 8	7
8— 7	3
7— 6	11
6— 5	13
5— 4	14
4— 3	15
3— 2	8
2— 1	8
Below 1	3
Total	87

Table IV.

Derris elliptica, Changi No. 3.

Rotenone Content of Marketable Roots from Individual Plants at Serdang and Kuala Lumpur arranged in Groups of 1 per cent.

Rotenone (moisture-free basis)	No. of Samples.
per cent.	
13—12	1
12—11	2
11—10	11
10— 9	34
9— 8	27
8— 7	9
7— 6	3
Total	87

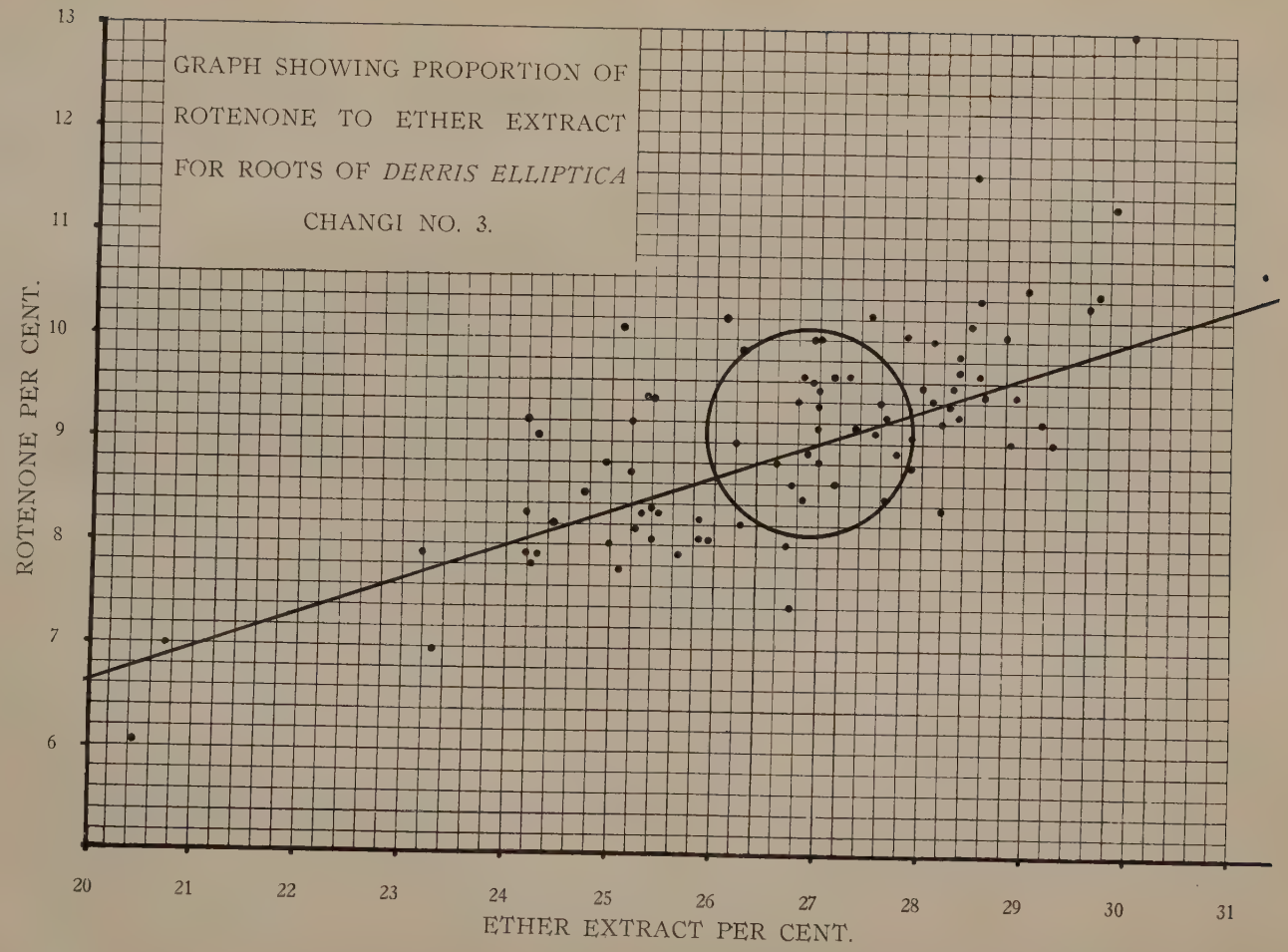
GRAPH SHOWING PROPORTION OF
ROTENONE TO ETHER EXTRACT
FOR ROOTS OF *DERRIS ELLIPTICA*
CHANGI NO. 3.
ROTENONE PER CENT.
13
12
11
10
9
8
7
6
20
21
22
23
24
25
26
27
28
29
30
31
ETHER EXTRACT PER CENT.

Table V.

Derris elliptica, Changi No. 3.

Ether Extract of Marketable Roots from Individual Plants at Serdang and Kuala Lumpur arranged in Groups of 1 per cent.

Ether Extract (moisture-free basis)	No. of Samples.
per cent.	
32 — 31	1
31 — 30	—
30 — 29	6
29 — 28	18
28 — 27	14
27 — 26	19
26 — 25	15
25 — 24	10
24 — 23	2
23 — 22	—
22 — 21	—
21 — 20	2
Total	87

Table VI.

Derris elliptica, Changi No. 3.

Proportion of Rotenone to Ether Extract in Marketable Roots from Individual Plants at Serdang and Kuala Lumpur arranged in Groups of 1 per cent.

Proportion of Rotenone to Ether Extract	No. of Samples.
per cent.	
43 — 42	1
42 — 41	—
41 — 40	2
40 — 39	1
39 — 38	—
38 — 37	8
37 — 36	5
36 — 35	9
35 — 34	13
34 — 33	13
33 — 32	15
32 — 31	11
31 — 30	4
30 — 29	4
29 — 28	—
28 — 27	1
Total	87

Tables IV, V and VI, in which the figures for rotenone, ether extract and proportion of rotenone to ether extract are divided into groups of 1 per cent. respectively give a better indication of the frequency of variation in each case.

The results of analysis are also shown graphically; the figures for rotenone have been plotted against the corresponding figures for ether extract and the graph based on the average proportion of rotenone to ether extract for all the samples.

The graph shows clearly the narrow frequency of variation, while the circle, which has been drawn with a centre represented by 9.20 per cent. rotenone and 26.75 per cent. ether extract (these being the average figures for rotenone and ether extract for all the samples) and a radius corresponding to 1 per cent. rotenone or ether extract, includes no less than 26 of the 87 samples.

Confirmation of the narrow frequency of variation in respect of this race was obtained by carrying out similar analyses of roots from six plants of varying ages selected at random in fields at Changi, Singapore.

The weights of marketable roots for the individual plants varied from 14.65 to 3.30 ozs. with an average of 6.45 ozs.

The rotenone varied from 10.55 to 7.90 per cent. with an average of 9.30 per cent., the ether extract from 31.20 to 24.70 per cent. with an average of 27.50 per cent.

The proportion of rotenone to ether extract varied from 36.5 to 31.3 per cent. with an average of 33.8 per cent.

Table VII gives the detailed results, average figures for all the Serdang and Kuala Lumpur roots being added for purposes of comparison.

Table VII.

Derris elliptica, Changi No. 3.

Comparison of Relationships between Rotenone Content and Ether Extract of Roots from Singapore, Serdang and Kuala Lumpur.

Location and Serial No. of Plant	Rotenone (moisture-free basis)	Ether Extract (moisture-free basis)	Proportion of Rotenone to Ether Extract
	per cent.	per cent.	per cent.
SINGAPORE			
1 ...	7.90	24.70	31.9
2 ...	9.40	25.70	36.5
3 ...	9.45	27.75	34.1
4 ...	10.55	31.20	33.8
5 ...	9.60	27.40	35.0
6 ...	8.85	28.25	31.3
Average (for all plants)	9.30	27.50	33.8
Average (for all plants) from Serdang and Kuala Lumpur) ...	9.20	26.75	34.0

(d) *Derris elliptica, Singapore No. 1.*

Only a small number of cuttings of this race were available and these were established at Serdang.

Similarly to Changi No. 3, the plants were strong and vigorous in growth and free from attacks by insect pests.

Twenty-one plants were lifted; the weights of marketable roots for the individual plants varied from 10.50 to 0.90 ozs. with an average of 3.65 ozs.

The results of analysis which are given in detail in Table VIII indicate rather a wide range of variation in respect of both rotenone and ether extract. The range of variation in respect of proportion of rotenone to ether extract is, however, not so marked.

Table VIII.

Derris elliptica, Singapore No. 1.

Relationship between Rotenone Content and Ether Extract of Roots.

Location and Serial No. of Plant	Rotenone (moisture-free basis)	Ether Extract (moisture-free basis)	Proportion of Rotenone to Ether Extract
SERDANG	per cent.	per cent.	per cent.
1 ...	6.10	17.55	34.8
2 ...	4.45	14.40	30.9
3 ...	6.05	17.00	35.6
4 ...	4.40	15.05	29.2
5 ...	6.00	18.50	32.4
7 ...	4.50	14.95	30.1
8 ...	5.50	15.80	34.8
9 ...	5.85	17.20	34.0
10 ...	5.95	18.75	31.7
12 ...	3.75	13.55	27.7
13 ...	5.30	14.80	35.8
14 ...	4.95	14.00	35.3
15 ...	4.80	14.60	32.9
16 ...	6.45	18.50	34.9
17 ...	4.90	16.15	30.3
18 ...	6.30	19.65	32.1
19 ...	4.80	15.05	31.9
20 ...	4.40	14.95	29.4
21 ...	6.15	17.85	34.5
Average (for all plants)	5.30	16.20	32.5

The rotenone varies from 6.45 to 3.75 per cent. with an average of 5.30 per cent., the ether extract from 19.65 to 13.55 per cent. with an average of 16.20 per cent.

The proportion of rotenone to ether extract varies only, however, from 35.8 to 27.7 per cent., the average being 32.1 per cent.

(e) *Derris elliptica, Singapore No. 2.*

Only four cuttings of plants of this race were available and these were established at Serdang.

The plants were remarkably strong and vigorous in growth, while the race appears to be characterized by a strong root development. The weights of marketable roots per plant varied from 40.60 to 11.45 ozs. with an average of 20.40 ozs. per plant. A yield of 40.60 ozs., approximately 2½ lbs., is the highest figure yet recorded for any individual derris plant in these investigations.

Compared with yield of root, the rotenone content and ether extract were disappointing as the figures in Table IX show. The rotenone varies from 6.50 to 5.50 per cent., with an average of 6.05 per cent., the ether extract from 17.05 to 14.75 per cent. with an average of 15.85 per cent.

The proportion of rotenone to ether extract varies from 39.2 to 37.3 per cent. with an average of 38.2 per cent.

Table IX.

***Derris elliptica*, Singapore No. 2.**

Relationship between Rotenone Content and Ether Extract of Roots

Location and Serial No. of Plant	Rotenone (moisture-free basis)	Ether Extract (moisture-free basis)	Proportion of Rotenone to Ether Extract
SERDANG	per cent.	per cent.	per cent.
1 ...	6.35	17.05	37.3
2 ...	5.50	14.75	37.4
3 ...	6.50	16.55	39.2
4 ...	5.90	15.10	39.1
Average (for all plants)	6.05	15.85	38.2

Summary of Results of Investigation.

The following observations are offered on the results which have been summarized in Table X. Results obtained previously (1) for another race of this species, also described by Henderson (2)—*D. elliptica*, Sarawak creeping—have also been included for purposes of comparison.

While wide variations exist in the rotenone content and ether extract of roots from the different races the results show clearly the superiority of Changi No. 3 in these respects. There is also evidence that within the limits of the area from

Table X.

Summary of Results of Analysis of Root Systems of Plants of Various Races of *Derris elliptica*, Based on Henderson's Classification.

Particulars of Race	No. of Samples Analysed	Rotenone (moisture-free basis)			Ether Extract (moisture-free basis)			Proportion of Rotenone to Ether Extract		
		Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Changi No. 1 ...	42	9.10	2.00	5.80	28.25	9.00	21.30	34.9	16.5	27.0
Changi No. 2 ...	16	8.45	5.40	6.60	26.90	18.60	22.05	36.5	26.0	30.0
Changi No. 3 ...	87	13.00	6.05	9.20	31.30	20.45	26.75	43.3	27.6	34.0
Singapore No. 1 ...	21	6.45	3.75	5.30	19.65	13.55	16.20	35.8	27.7	32.1
Singapore No. 2 ...	4	6.50	5.50	6.05	17.05	14.75	15.85	39.2	37.3	38.2
Sarawak creeping* (selected plants) ...	20	7.30	6.15	6.75	29.65	25.00	27.30	28.6	21.4	24.7

* The figures for rotenone content are only approximate. They are calculated values based on the average proportion of 24.7 per cent. found for roots from selected plants (1)

which cuttings were selected the range of variation in respect of present standards of toxic content is less than with the other races.

Further, Changi No. 3 has the additional advantage of being established more easily on inland soils than Changi No. 1 or Changi No. 2, also of being less liable to attacks by insect pests.

Changi No. 3 would therefore appear to be the most desirable race for propagation according to present commercial standards of toxicity. It is understood that this race is not widely established; it is not popular with the growers who supply the local market owing to the nature of the roots. These are not of the fleshy and tapering type found with Changi No. 1 and Changi No. 2 and favoured by the market gardener, who relies on appearance as an indicator of quality. The roots of Changi No. 3 are for the most part of a much finer texture; in fact some of the root systems of individual plants lifted at Serdang resembled bundles of coarse horse-hair. This relatively fine texture would be no disadvantage from the point of view of root for export, and, further, our investigations have shewn that the toxicity of very fine roots, say $\frac{1}{8}$ inch diameter and less, may be higher than that of roots of slightly greater diameter ([6]).

The figures in Table X indicate that the average toxicities of Changi No. 1 and Changi No. 2, calculated on a moisture-free basis, are as follows:—

	per cent.
Rotenone	6.20
Ether extract	21.70

The average moisture content of air-dried commercial consignments of root in Singapore is approximately 10 per cent. Calculated on this basis, there is a corresponding reduction in the rotenone content and ether extract as follows:—

	per cent.
Rotenone	5.60
Ether extract	19.55

The above figures are in close agreement with those found previously for average samples of Changi root ([1]).

Taking the figures for Changi No. 3 on an air-dry basis of 10 per cent., calculation shows that the average figures for rotenone content and ether extract are as follows:—

	per cent.
Rotenone	8.30
Ether extract	24.05

Provided toxicity is an inherent character, the gradual substitution of Changi No. 3 for Changi No. 2 would result in the present Singapore standard being raised by approximately 40 per cent. in respect of rotenone and 25 per cent. in respect of ether extract. Further, the possibility of establishing clonal types with a rotenone content of approximately 12.5 per cent. and an ether extract of 28 per cent. must not be overlooked.

Neither Singapore No. 1 nor Singapore No. 2 merits consideration in view of the relatively low toxicity, particularly ether extract, of the roots. Reference to Table X shews that the average figure for the ether extract of Singapore No. 1 root is 16.20 per cent., calculated on a moisture-free basis. On a moisture basis of 10 per cent., which is the average figure for air-dried commercial consignments of root for export, the above figure would be reduced to approximately 14.60 per cent. This is 3.40 per cent. below the present market standard for ether extract.

The low ether extract is disappointing, more especially in the case of Singapore No. 2, which appears to be characterized by a strong root development.

Attention might be drawn here to the commercial possibilities of *D. elliptica*, Sarawak creeping. Experiments at Serdang and at Kuala Lumpur show that the plants are strong and vigorous in growth.

Selection experiments have already been carried out with this race at Serdang and cuttings from plants with roots of proved high toxicity established (1). The limits of the toxicities of the parent plants are shown in Table X. These indicate that, although the rotenone content is less than that of Changi No. 3, the ether extract is of the same order.

Provided, therefore, the plants remain true to type, this race with its relatively high ether extract may well prove satisfactory for cultivating on a commercial scale, especially as it is now generally recognized that the rotenone content *per se* is not an index of the toxicity of the root.

Outline of Further Work.

Cuttings from all the plants of Changi No. 3 examined have been established, partly at Serdang and partly at Kuala Lumpur.

Cuttings from some of the outstanding plants have been kept separate and are being propagated as individual clones with a view to studying inter- and intra-clonal variations. The factors underlying selection of these special plants were (a) yield of root (b) rotenone content, and (c) ether extract.

The remainder of the cuttings have been planted as mixed clonal material with the object of increasing stocks of planting material of this race. Care was taken to randomize the cuttings as much as possible.

Mixed populations of the other races have also been established. In these cases, cuttings have been restricted to those from parent plants in which the "fine" or marketable roots exceeded the present Singapore standard of rotenone content 5 per cent., and ether extract 18 per cent., calculated on a 10 per cent. and moisture basis.

Acknowledgment.

The writers wish to acknowledge the assistance of Mr. J. N. Milsum, Acting Agriculturist, in the conduct of this investigation.

References.

1. Georgi, C. D. V., Lambourne, J., and Gunn Lay Teik. Preliminary Selection Experiments with Derris. *Malayan Agricultural Journal,* Vol. XXIV, No. 8, August, 1936, p. 374.
2. Georgi, C. D. V., Greig, J. L. and Gunn Lay Teik. Varietal and Manurial Trials with Derris. *Malayan Agricultural Journal,* Vol. XXIV, No. 6, June, 1936, p. 268.
3. Georgi, C. D. V. and Curtler, E. A. The Periodic Harvesting of Tuba Root (*Derris elliptica,* Benth.). *Malayan Agricultural Journal,* Vol. XVII, No. 9, September, 1929, p. 326.
4. Georgi, C. D. V. Variations in the Amount of Ether Extract of Tuba Root (*Derris malaccensis,* Prain). *Malayan Agricultural Journal,* Vol. XVII, No. 10, October, 1929, p. 361.
5. Henderson, M. R. The Sources of "Tuba" in the Malay Peninsula. *Malayan Agricultural Journal,* Vol. XXII, No. 3, March, 1934, p. 125.
6. Georgi, C. D. V. and Gunn Lay Teik. Notes on the Preparation of Derris Root for Export together with a Suggested Method for Evaluation. *Malayan Agricultural Journal,* Vol. XXIV, No. 10, October, 1936, p. 489.

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CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

1st Quarter, 1937.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S. in collaboration with the Field Branch of the Department.

Rainfall.

The quarter was remarkably dry throughout Malaya, drought conditions being recorded in certain districts, but rain was general towards the end of March. In Province Wellesley, January was a wetter month than usual, and in Perak South heavy rains were experienced in the last week of both January and February.

Prices.

Prices, which were high at the beginning of the year, weakened somewhat in February, but rose considerably in March, following the trend of the market. Tables I and II give respectively the range of the lowest and highest prices and their means.

Production.

Production on small holdings during the quarter is summarized in Table III which is compiled from the monthly reports of production, stocks, imports and exports of rubber published by the Registrar-General of Statistics, S.S. and F.M.S.

Tapping.

The usual quarterly survey of small holdings out of tapping was made, estimates being calculated by counting the number of holdings out of tapping, and applying the percentage to the total area of small holdings in the relative District.

The results of the survey are summarized in Table IV, and in Table V are given the corresponding figures for the previous quarter and for the first quarter of 1936.

To enable figures to be compiled for the whole of Malaya, an estimate has been made of the area out of tapping in Perlis, Kelantan and Trengganu by applying the percentage for the rest of Malaya to the acreage of small-holding rubber in those States. It has thus been estimated that 298,600 acres (25.7 per cent.) were out of tapping in Malaya at the end of March as compared with 357,195 acres (30.8 per cent.) at the end of December 1936.

There was a further considerable increase in the areas in tapping as was to be expected with the improvement in price. On the other hand, the incidence of padi harvesting increased the area out of tapping in certain districts; also,

Table I.

Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul (133 1/3 lbs.))

1st Quarter 1937.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JANUARY					
Smoked sheet	45.50-51.00	39.70-50.50	42.00-48.00	43.00-48.25	41.00-51.00	45.00-49.50	40.00-51.00	40.00-51.00
Unsmoked sheet	43.00-51.00	41.00-49.50	38.00-46.80	38.00-47.20	41.00-47.00	44.50-48.50	41.50-48.20	37.00-49.75
Scrap	32.00-45.50	28.00-30.00	30.00-40.00	—	34.00-42.50	40.00-45.50	36.50-42.50	32.00-45.67
			FEBRUARY					
Smoked sheet	44.00-50.00	42.00-50.00	44.00-47.00	43.00-47.50	41.29-46.20	45.00-50.50	43.00-49.00	42.50-47.00
Unsmoked sheet	43.00-49.20	40.00-49.00	39.00-46.00	42.00-46.50	40.00-44.50	44.50-49.00	42.00-46.00	41.00-45.50
Scrap	32.00-43.50	28.00-30.00	32.00-40.00	—	34.00-40.00	40.00-44.00	35.00-41.00	31.00-40.30
			MARCH					
Smoked sheet	47.00-59.00	44.00-55.00	46.00-56.00	43.00-53.70	42.00-54.37	47.00-55.00	46.00-55.00	45.50-55.00
Unsmoked sheet	46.50-58.50	39.00-52.80	40.00-53.80	42.00-51.50	41.00-52.00	46.00-53.00	46.00-54.00	42.00-54.00
Scrap	33.00-48.50	40.00-41.00	24.00-45.00	—	35.00-43.90	41.00-50.50	35.00-46.00	36.00-46.00

Table II.

Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul (133 1/3 lbs.))

1st Quarter 1937.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JANUARY					
Smoked sheet	46.77-50.50	44.54-48.55	43.83-47.33	43.78-47.78	43.58-47.62	46.17-48.17	44.25-49.55	43.93-46.33
Unsmoked sheet	44.95-50.62	41.71-46.01	40.75-45.08	41.30-46.54	42.52-44.62	44.66-46.83	44.25-47.55	41.97-44.92
Scrap	36.12-40.00	28.00-30.00	35.00-37.50	—	36.50-39.00	40.83-44.66	37.50-40.50	36.45-39.59
			FEBRUARY					
Smoked sheet	46.00-48.25	42.87-46.02	44.60-46.32	43.50-46.70	42.89-45.12	46.83-48.50	44.12-47.00	44.08-45.23
Unsmoked sheet	43.92-46.92	41.82-44.80	41.82-44.12	42.20-45.20	41.05-43.35	44.66-47.00	42.75-44.62	42.28-43.87
Scrap	34.88-38.12	28.00-30.00	36.00-36.50	—	36.50-38.50	40.83-43.33	37.66-39.50	35.14-37.74
			MARCH					
Smoked sheet	48.00-56.33	47.06-52.79	49.70-54.70	46.62-52.80	44.47-51.51	51.50-54.50	48.75-52.50	48.72-53.09
Unsmoked sheet	46.98-54.67	46.00-50.51	44.00-49.82	44.40-50.80	42.63-49.56	49.17-52.83	48.00-50.88	46.51-51.38
Scrap	39.62-43.62	40.00-41.00	34.00-37.50	—	38.00-40.95	46.17-48.50	38.33-41.66	39.36-42.62

Table III.

Production of Rubber on Small Holdings

(in tons)

	Total Year 1936	1st Quarter 1936	1st Quarter 1937
Federated Malay States ...	62,596	14,796	19,764
Unfederated Malay States ...	56,759	11,561	19,310
Straits Settlements ...	12,532	2,997	3,769
Total ...	131,887	29,354	42,843

with wintering in progress, many small-holders are reported to have disposed of their coupons early in the quarter, and thus had no incentive to tap when their trees had reverted to normal conditions. Heavy rains at the end of March were doubtless also responsible for the increase in some localities.

Condition of Holdings.

Advantage was taken of the wintering season to do clearing work on many holdings, and reports indicate that holdings generally are being maintained in a satisfactory condition, and improvements are shewn in those areas visited by the Asiatic Rubber Instructors. Mention is also made of increased activity on holdings owned by Chettiars and Chinese since the rise in price of rubber.

Diseases.

Cases of *Oidium Heveae* were reported in several districts, but no complaints of unusual severity of attack were received. Mouldy Rot was prevalent as usual, but the continued dry weather did much to effect control; sales of approved fungicides were made through the Department. A few cases, of a minor nature, of Pink Disease were reported.

Sales of insecticides and demonstrations were continued in the North and South Pahang Circles for root diseases due to "white ants". The root diseases, *Fomes lignosus* and *Ganoderma pseudoferreum* were encountered and dealt with by small-holders on the advice of Agricultural Officers.

With reference to soil erosion, the Negri Sembilan report states that conditions on Chinese and Indian holdings definitely shew some improvement,

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of March, 1937.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	33,227	7,300	22	Klang	15,410	4,600	30	Seremban	22,176	18,800	85	Raub	9,342	3,300	35
Kinta	36,090	5,400	15	Kuala Langat	23,333	4,700	20	Tampin	16,961	7,100	42	Kuala Lipis	14,588	6,800	47
Kuala Kangsar	79,572	15,100	19	Ulu Langat	39,856	8,400	21	Kuala Pilah	26,586	15,200	57	Bentong	11,574	2,400	21
Upper Perak	12,680	2,700	21	Ulu Selangor	25,857	4,100	16	Jelebu	8,917	2,000	22	Other Districts†	40,383	14,100	35
Larut & Selama	38,210	3,800	10	Kuala Lumpur	19,327	6,400	33	Port Dickson	11,634	7,300	63				
Krian	9,270	5,400	58	Kuala Selangor†	9,512	2,200	23								
Lower Perak*	25,982	4,900	19												
Dindings	9,273	6,900	74												
	244,304	51,500	21		133,295	30,400	23		86,274	50,400	58		75,887	26,600	35

MALACCA				PENANG & P. WELLESLEY				SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Central	13,109	8,300	63	North	3,941	500	13	Singapore	20,591	200	1
Alor Gajah	30,203	5,700	19	Central	9,549	2,800	29				
Jasin	22,883	4,300	19	South	7,508	4,700	63				
				Penang	15,822	1,600	10				
	66,195	18,300	28		36,820	9,600	26		20,591	200	1

JOHORE	322,225	64,400	20
KEDAH	100,691	27,200	27
PERLIS KELANTAN & TRENGGANU	77,016	20,000	26

The percentage of areas out of tapping in December, 1936, was as follows:—Perak 28, Selangor 44, Negri Sembilan 62, Pahang 25, Malacca 20, Penang and Province Wellesley 24, Singapore 1, Johore 23, Kedah 35.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

Table V.

Comparison of Areas of Rubber Small Holdings Out of Tapping.

	March, 1936		December, 1936		March, 1937	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S.	219,300	41.0	202,600	37.5	158,900	29.5
S. S.	39,400	33.8	22,200	18.0	28,100	22.7
U.M.S.	221,200	44 2	132,400	26.5	111,600	23.3
Malaya	479,900	41,8	357,200	30.8	298,600	25.7

as, in addition to allowing natural covers to become established, a considerable number of owners of holdings are acting on advice given for the construction of silt pits and other preventive measures. Amongst the Malay-owned holdings little, if anything, is being attempted, but owners are allowing natural covers to become established where past damage does not prevent this.

General.

The Pahang report states that the rubber-dealers' scheme inaugurated in that State continues to work smoothly, and is assisting in improving the general quality of rubber produced.

Nearly all reports comment on the improved economic circumstances of rubber small-holders, the only cases of hardship encountered being those of owners who had leased their holdings to Chinese at very low rates. Even in such cases it is reported that the lessees are readily meeting the entreaties of the owners for extra payments.

The successful buddings on a Johore holding have made excellent progress, and for the purpose of supplying and budding an additional 1,000 trees further budwood has been obtained.

One result reported of the high prices is that small-holders are in constant fear of a major drop in the market, and for that reason are tapping heavily, selling the rubber in a wet state, in order to benefit as much as possible now.

A Johore report mentions that most of the Chinese small-holders—and one or two Malays—continue to avail themselves of the cheap facilities for smoking offered by the large communal smoke cabinets. In spite of the increase in the price of rubber the curing charge remains at a low level, 20 to 30 cents per picul, and it is noteworthy that this charge is even lower than when rubber was

at a third of its present price. The same report also states that the ready sale value of scrap has resulted in numerous convictions for theft.

Another Johore report states that a considerable business has been done latterly in uncouponed rubber, the minimum price being $12, and the maximum $21 per picul.

As a result of a Penghulus' Conference in Larut, Perak, all rubber dealers in that District have been requested to display ruling prices, together with samples of smoked sheet, good unsmoked sheet, and bad unsmoked sheet, as prepared by small-holders.

The type of coagulant used on small holdings varies considerably: in Upper Perak, only 15 per cent. use sulphuric acid, whereas in the Kuala Kangsar District tests shew that formic acid was used in only 20 to 30 per cent. of the samples tested. On the other hand, another report from Perak shews that the use of sulphuric acid continues and increases, becoming more prevalent in the Tanjong Malim Sub-district which was previously a stronghold of formic acid.

A Malay holding at Batang Padang recently budded is now making satisfactory progress after an attack of *Helminthosporium Heveae*.

A number of additional smoke cabinets have been erected in different parts of the country, but reports indicate that the majority of cabinets remain idle owing to the small premium offered for smoked sheet. A small-holder in Penang who owns a cabinet has been obtaining a regular premium of $2 per picul by taking his produce to Georgetown in preference to selling it to the local dealer.

The sale of coupons continues, small-holders being reported as treating coupons and rubber as separate commodities; the value of the former during the quarter was from $32 to $35 per picul equivalent.

Abstract.

SELECTED NOTES ON THE MANURING OF TEA*

In the early development of tea planting in Ceylon, land under virgin forest was cleared and planted, and for a considerable time no thought was given to manuring. This period, however, was a short one, for by 1896 although manuring was still a novelty, the practice was spreading on old coffee estates, although occupants of virgin jungle but slowly learned their lesson from the older cultivators. The sources of manures were local and oil-cakes and bones from India were chiefly used.

During the ensuing ten years there was a marked expansion in manuring, nitrogen being the chief manurial constituent, and organic forms were predominant.

In the next decade, closing at a time when war influences were being felt in the fertilizer industry, a large variety of fertilizers were introduced. In particular, inorganic manures were imported at competitive prices and, in consequence of trials and demonstrations by the research stations of India and Java, they became an important factor in manurial schemes. Of the organic manures used, castor cake, groundnut cake, fish manure and bloodmeal were the most popular, the popularity of each being largely determined by price per unit of nitrogen and the ease with which supplies could be maintained.

Of the inorganic fertilizers sulphate of ammonia has proved the cheapest of all sources of nitrogen and its use has progressed by leaps and bounds till now it is the largest individual source. Nitrate of soda comes second in importance, but both this and cyanamide have entered a very chequered stage in their history.

The above observations refer to the total consumption of fertilizers in Ceylon, but they largely represent the conditions of tea manuring, as before 1917 the area under tea was twice that under rubber, while during the last two periods the manuring of rubber has diminished.

A subsidiary method of manurial conservation is that of burying tea prunings. Formerly, much woody tissue was buried, which not only complicated the soil nitrogen cycle, but was instrumental in spreading root diseases. It is now usual either to fork in the soft green shoots or to mulch the prunings and beat off the dried leaves for subsequent burial. Except in areas of severe root disease, no epidemic diseases occur from this cause.

Summary of Results from Manuring Experiments.

The Institute's manurial trials are now in their sixth year.The results so far can be summarized as follows:—

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* Abstract of Bulletin No. 16 of The Tea Research Institute of Ceylon, "Selected Notes on the Manuring of Tea" by T. Eden, D.Sc. (Manc.), A.I.C. This abstract omits reference to many interesting general notes on manures and manuring which form the major portion of the publication.

INFLUENCE ON YIELD.

Nitrogen is the chief yield promoter in tea; up to 40 lbs. per acre per annum (the upper limit for which results are at present available) the response is directly proportional to the quantity applied. On an average 1 lb. of nitrogen may be expected to produce 4 to 5 lbs. of tea.

The nitrogen of artificial manures of the various types is not used very efficiently. The data of the Institute's experiments provide the only estimate made of the efficiency of manuring in the sense of a comparison between the amount of manure supplied and the amount recovered in the growing plant. The percentage recovery in new growth is under 20 per cent.

Normally the largest part of the crop secured is the result of nutrients derived from the soil rather than from the artificial manures.

There appears to be no difference between inorganic and organic nitrogeneous artificials as regards their capacity for giving increased yields, neither is there any evidence that the former produces rush crops shortly after application.

During the five completed years potash has produced no increase in crop.

Varying quantities of phosphoric acid were not studied in the first pruning cycle; in the second cycle now in progress 30 and 60 lbs. per acre were included. The results show that the beneficial effects of phosphoric acid are limited to the smaller dose, there being no further yield increase when an extra 30 lbs. is included in the manurial mixture.

There is no evidence that at different times in the pruning cycle, manures of different ratios with respect to nitrogen, phosphoric acid and potash are necessary.

The returns from mixtures applied at pruning time are small and cannot be relied upon. Recovery from pruning appears to be governed by the reserves present in the bush and not by manures applied at a time when the bush is devoid of foliage.

Manures applied late in the pruning cycle do not benefit the crops in the succeeding cycle in comparison with manures applied early in that cycle, *i.e.*, any superiority in growth shown at the end of the cycle as a result of this pre-pruning mixture is subsequently lost owing to the intervention of the pruning operation.

INFLUENCE ON QUALITY.

Nitrogen in the moderate quantities used (40 lbs. per acre) has no harmful effect on the quality of the manufactured tea. No distinction can be drawn between inorganic and organic artificials in this respect.

Up to the present, phosphate has shown no significant effect.

At the end of the fourth year of these experiments potash began to show an effect which has so far been consistently maintained in the favour of potash manuring.

ANNUAL PRIZE DISTRIBUTION, SCHOOL OF AGRICULTURE, MALAYA.

The annual prize distribution at the School of Agriculture, Serdang, took place on Saturday morning, April 17th. In addition to the staff and students there were present the Hon'ble The Acting Federal Secretary (Mr. H. Fraser), the Hon'ble The Director of Agriculture, S.S. and Adviser on Agriculture, M.S., (Mr. O. T. Faulkner, C.M.G.) and the following members of the School Advisory Committee, Messrs. H. J. Page, R. Boyd and P. A. Rogers.

The Adviser on Agriculture welcomed the Federal Secretary and the members of the Advisory Committee. In the course of his speech he reminded those students who were leaving that they should remain students to the end of their days. They should not regard themselves as finished products because they now had diplomas, but should leave the School with a strong determination to build on the foundation of knowledge they had acquired there. Turning to those students who had not yet completed their course and were remaining at the School he impressed upon them the great importance which he attached to practical work. In agriculture particularly theory and practice must go hand in hand—as equal partners.

Mr. G. E. Mann, the Principal of the School, associated himself with Mr. Faulkner's welcome to Mr. Fraser and to the members of the committee, and said, *inter alia*.

"The outstanding event of the year lies possibly in the fact that, for the first time in our brief history, the School has been full to capacity. The fact that we have reached capacity indicates that the value of the School is well realised. But I would point out that we cannot expect to remain quite full in the immediate future. You will remember that, in 1933, we changed the Major Course from one of 3 years to one of 2 years' duration. In normal circumstances, that change automatically reduces the number of classes from 4 to 3. It so happens that, during the past two years, the One Year Course has been abnormally large—so large, in fact, that it has had to be divided into two classes. We cannot expect this to continue, for the majority of the Unfederated States (which have made good use of this course) have now more or less completed the building up of their subordinate agricultural staff. We must therefore, in future, rest content if we have about 70 students on the register.

In relation to the purely agricultural side of our training, there have been no important changes during the year. I regret to say that our experiments in training certain students in colloquial Tamil, which began two years ago, have not been as successful as I had hoped. There is no cause for anxiety in respect of Chinese students who can speak one or more dialects of their mother tongue for, with them, colloquial Tamil cannot be regarded as a necessity. But, in the case of students who look forward to working on estates which employ Indian labour, a knowledge of that language is obviously essential and—I would add—it

should be a sound knowledge, sufficient not merely for a man to convey the usual routine instructions involved in such work but also for him to understand the labourers' life and customs and to win their respect and confidence.

This leads me to the subject of actual results in finding employment for ex-students during the past year. Of the 47 students who left a year ago, some 24 obtained posts immediately in Government service and in the Rubber Research Institute. Since then, one has been found a post in the Entomological Division of this Department, two or three more have found their way into the Rubber Research Institute as laboratory assistants, two Malays were found employment on an estate in Johore (of whom one unfortunately proved to be unsatisfactory), and three students gained jobs in Singapore in various capacities. A fair number of enquiries have been received from estates but in most cases Indians and not merely Tamil-speaking students have been insisted on and we have not been able to supply the demand for the simple reason that no Indian students were available. It is to me a somewhat remarkable fact that more use is not made of this School by Indian estate conductors in carrying the education of their sons beyond the English school stage. Possibly they cannot afford to do so, possibly they do not realise yet that this School exists. Enquiries will be made into the matter as soon as possible.

To-day, a further 54 students are leaving us. It is expected that some 20 of these will enter Government service in Malaya, and that 7 or 8 will be taken on by the Rubber Research Institute as Asiatic Rubber Instructors and as laboratory assistants, while at least two of the senior students have independent prospects. What will happen to the balance remains to be seen, but I must here emphasize one point. The figures which I have quoted include students from the Two Years and the One Year Course. While a certain number of One Year Course boys are usually absorbed into Government Service, the course is not designed to fit a boy for estate employment. Apart from prospective government employees, it is intended for young men who propose to go back to their family holdings and devote the knowledge they have gained here towards improving the standard of village agriculture, including animal husbandry—in which subject each student receives both theoretical and practical instruction which could, I feel, be put to considerable use by anyone possessing the necessary interest and initiative.

We are rather proud of our poultry section at the School, in that, apart from giving students some useful training, we are engaged on what I personally regard as essential and fundamental research work. It is all on a very small scale at present, and we are constantly coming up against problems with we cannot satisfactorily tackle because they require large scale investigation; but, if expansion in this direction should one day come to be regarded as necessary, we shall at least have played an important part in the laying of sound foundations".

In concluding his address, Mr. Mann referred to recreations, the Annual Sports Meeting, the inauguration of an Old Boys Society and the issue of a School Magazine. Finally he expressed his thanks to his staff and the staff of the Central Experiment Station and to others for their willing help during the year.

Mr. Fraser then addressed the students. He expressed the honour he felt at being invited to be present on such a happy occasion. He considered that the importance of agriculture to Malaya could not be over-emphasized and that Government was fully alive to this—as evidenced by the existence of the School which they were now leaving. He reminded the students how fortunate they were in their Principal, Mr. Mann, and in the fact that their School was part of an agricultural department which deservedly has earned a world-wide reputation. The training they had received in this School should make them useful members of society, and touching on the question of those students who had not yet secured definite employment he indicated that a wide field of usefulness could be theirs if they would return to their homesteads and devote themselves to the improvement of native agriculture. He said that in this sphere they could perform services equally valuable with those of the students who had secured employment in official or semi-official capacities.

Mr. Mann then called upon Mr. Fraser to distribute the prize, diplomas, and certificates which had been awarded in respect of the various courses of training.

Mr. H. J. Page, the Director of the Rubber Research Institute, then addressed the students and in the course of his speech reminded them of the close relationship which exists between the Institute, the Department of Agriculture, and the School. He was happy to tell them of the good work being done by some twenty-eight former students of the School who are now employed by the Institute, either as field instructors or laboratory assistants, and was glad to acknowledge the School's value to the Institute in this connexion.

Mr. Page brought the meeting to a close by expressing on behalf of the committee, staff, and students a hearty vote of thanks to the Federal Secretary for his kindness in officiating at the presentation.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports by Agricultural Officers.

April, 1937.

The Weather.

The inland region, as defined for purposes of rainfall, embraces the whole of Malaya except for the east coast and a strip of the west coast roughly from Port Dickson to Muar. April is normally a wet month throughout this region, but this year precipitation was even higher than usual, especially in the north, where the figures recorded for most stations in Kedah and Perak are considerably above the average for the month. An exception to this generality is provided by an inland strip running north from Batu Pahat through Segamat and Kuala Pilah to Temerloh where precipitation approximated to normal in the south at Batu Pahat and Segamat and was much below normal at Kuala Pilah and Temerloh.

On the east coast of Pahang and Kelantan the rainfall was above the average for the month, yet the figures for Endau on the Johore coast were well below normal.

In the west coast region the rainfall recorded for Muar and Port Dickson was below normal.

Remarks on Crops.

Padi.—An estimate of the Kedah crop places it at some 82 million gantangs, which is 14 million gantangs below the estimated crop of last season. At Panchang Bedena in Selangor there is again some loss from empty grains, or *padi jantan* as it is termed locally, resulting from unavoidable periodic water shortage during the growing period. Some 30,000 gantangs of padi have been sold to date at Sungei Besar at 7½ and 8 cents a gantang. The crop return for Negri Sembilan is 10,778,712 gantangs which is 350,000 gantangs above last year's return. Reports from Pahang state that the padi entered for the competitions is generally of a higher standard than last season. Further demonstrations on the use of the *Tajak* and on making raft nurseries were given in Temerloh District.

The mill price of padi remains at $2 a picul in Province Wellesley and Krian and has shown a slight rise in Kedah to $11.50 to $12.50 per kuncha of 160 gantangs.

Rubber.—During the month over eighty samples of rubber were received from Agricultural Officers, the majority of which had been smoked by small-holders in the smoke cabinets erected in various parts of the country under the supervision of Departmental officers or officers of the Rubber Research Institute's Small-Holders' Advisory Service.

The Rubber Research Institute reports that nearly all the samples from Negri Sembilan, Province Wellesley and Penang were up to European standard; that the universal defect of all the other samples was specks and dirt; that, with only a little more care, 95 per cent. of the samples would reach European standard; and that the degree of variation in colour from sample to sample was no greater than is found in rubber from different European estates. The premia over unsmoked sheet paid for the rubber from which the samples were drawn ranged from as low as 80 cents to $3.15 a picul, but showed closer correlation to localities than to quality as was anticipated, thus indicating the need in certain localities for improved marketing if a well prepared product is to obtain a price commensurate with its quality.

Prices continued to rise early in the month to slightly above those quoted last month and then steadily declined, but there was again an upward tendency during the last week of the month.

As usual at the beginning of a restriction quarter, the quotations for coupons without rubber fell much more than the prices offered for rubber without coupons. Quotations for a picul equivalent of the former ranged between $16 and $24 whilst the quotations per picul for uncouponed rubber were from $20 to $32.10.

East Pahang reports that 40 smoke cabinets were working regularly throughout the month in Kuantan District and 30 of the 38 erected in Pekan District. A further 23 cabinets were erected in Brunei making a total of 83 in regular use in that State. The premium obtained in Brunei for smoked sheet over the unsmoked product ranges between $8 and $10 a picul.

Kelantan report records that during the last 2½ years the Department has sold 224 rubber mangles to small-holders on instalment purchase and 2½ demijohns of formic acid were similarly disposed of during the past twelve months.

Coconuts.—Copra declined in price during the month, the Penang quotations for sundried being $9 at the peak price and $7.20 a picul at the end of the month. The Bagan Datoh quotations ranged between $7.20 and $6.

A fairly large number of samples of copra from drying cabinets operating at both the Coconut Experiment Station, Port Swettenham, and in the Districts have been examined at Headquarters for moisture content during this and the preceding month. The results are somewhat disturbing, as they show that a large proportion of the copra prepared on these cabinets has been insufficiently dried. As drying to a moisture content of not more than 7 per cent. is a fundamental condition for well prepared copra, it is important to ensure that dryness is not sacrificed to a desire for speed in operation. Where there is any doubt whatsoever regarding the sufficiency of dryness of copra turned out by cabinets in the Districts, samples should be sent to Headquarters in standard airtight tins for examination and report.

Agricultural Stations.—There are no items of special interest to record in respect of Agricultural or Padi Stations.

DEPARTMENTAL NOTES.

Meeting of the Advisory Committee, School of Agriculture, Malaya.

A meeting of the above committee was held at the School of Agriculture on 17th April, 1937.

The school curriculum was discussed and it was decided that Agricultural Economics, Bookkeeping and Office Routine should be discontinued as separate subjects, that a measure of Economics should be introduced into lectures on Field Crops, and that instruction should be given in the Two Years Course on Estate Records and Reports.

The subject of employment of Malay students on estates was discussed at length. Finally, recommendations were drawn up for the consideration of Government.

The meeting considered the present system of scholarship especially in relation to nationality of holders. Recommendations on this subject will also be submitted to Government.

Rural Lecture Caravan.

Arrangements have been completed for a series of twelve tours to be made in 1937 by the Rural Lecture Caravan, which is operated jointly by the Department of Agriculture, the Co-operative Department and the Rubber Research Institute. The first four tours have been completed, the Caravan having visited Selangor, Perak Central (two tours), Krian and Kroh in Perak. Other visits of the Caravan will be to Province Wellesley and Penang, south Perak, Selangor, the Malayan Exhibition, Negri Sembilan and Pahang.

The Caravan continues to perform good service and to attract large crowds to see its cinema and listen to the lectures illustrated by lantern slides.

Leave.

Mr. J. Fairweather, Agricultural Officer, has been granted 9 months and 7 days leave from 7th May, 1937, inclusive.

Mr. J. Lambourne, Assistant Agriculturist, has been granted 5 months and 27 days leave from 8th May to 3rd November, 1937, before retirement.

Statistical.

MARKET PRICES.

April, 1937.

Major Crops.

Rubber.—April was a month of violent fluctuations in the rubber market, and there was a difference of 10 cents between the Singapore opening and closing prices. Spot loose opened at 45¼ cents per lb., and after an immediate slight improvement fell to 41⅞ cents on the 8th; there followed a further rise succeeded by a fall to 37⅛ cents on the 15th, with improvement again to 40⅛ on the 22nd: the market then again weakened, falling abruptly to 36⅝ on the 27th and to 34¾ on the 29th (37½ on the 28th), closing at 35¼ cents.

The average price for the month of No. 1 X. Rubber Smoked Sheet was 40.23 cents per lb. as compared with 39.80 cents in March. The London average price was 11.55 pence per lb., and the New York price 23.56 cents gold, as compared with 11.64 pence and 23.65 cents gold in March.

Prices paid for small-holders' rubber at three centres during the month are shewn in Table I.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, April, 1937.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.					Kuala Kangsar, Perak.		Batu Pahat, Johore.			
	1	8	15	22	29	7	28	7	14	21	28
Smoked sheet	56.40		48.50			53.90	48.10	52.00			
Unsmoked sheet	53.81	51.62	47.00	46 75	40.00			50.00	46 30	44.00	43.70
Scrap		42.00									

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.
No purchases at Kuala Kangsar on the 14th and 21st April.

Palm Oil.—Prices fell heavily during April and are given in Table II.

Table II.
Prices of Palm Oil and Palm Kernels.

Date 1937.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
April 2	£ 28. 0. 0	£ 15. 5. 0
„ 9	27. 0. 0	15. 5. 0
„ 16	24. 10. 0	14. 0. 0
„ 23	24. 10. 0	14. 0. 0
„ 30	22. 10. 0	13. 15. 0

Copra.—There was a downward tendency throughout the month in the Singapore copra market, a fall of $1.55 per picul from the opening price having been recorded by the end of April. The sun-dried grade opened at $8.35 per picul and fell to $7 on the 19th; there was a slight improvement for a few days, but the price again weakened, closing at $6.80.

The average price for the month for the sun-dried grade was $7.55 per picul as compared with $8.25 in March, and for the mixed grade was $7.14 as compared with $7.92.

Copra cake improved to $2.50 per picul in the second half of the month, the average price being $2.38.

Rice.—The average wholesale prices of rice per picul in March were as follows:—Siam No. 2 (ordinary) $4.44, Rangoon No. 1 $3.60, Saigon No. 1 $3.82, as compared with $4.66, $3.67 and $4.02 respectively in February. The corresponding March 1936 prices were: $3.85, $3.30 and $3.60.

The average retail prices in cents per gantang of No. 2 Siam rice in March were:—Singapore 29, Penang 36, Malacca 30, as compared with 32, 36 and 33 respectively in February.

The average declared trade value of imports of rice during March was $3.92 per picul, as compared with $4.15 in February and $4.00 in January.

Padi.—The Government Rice Mills, Perak, continued to pay $2 per picul for padi in April. Retail prices ranged from 6½ to 12 cents per gantang.

Pineapples.—There was a slight improvement in the prices of canned pineapples in Singapore, the range for G.A.Q. per case being: Cubes $3.10, Sliced Flat $2.90, Sliced Tall $3.15, and for the Golden quality $3.40, $3.30 and $3.45 respectively.

Prices of fresh fruit per 100 were: Selangor $1.20 to $1.50; Singapore $1.20; Johore 1st quality $1.10 to $2.60, 2nd quality 70 cents to $2.20, 3rd quality 40 cents to $1.80.

Beverages.

Tea.—Ten consignments of Malayan tea were sold on the London market during April. Two were of upland tea and sold at an average price of 1s. 3¾d. per lb., while the lowland tea was sold at average prices ranging from 1s. 2d. to 1s. 2¾d. per lb.

Average London prices per lb. during March for consignments of tea from other countries were as follows:—Ceylon 1s. 5.51d., Java 1s. 2.57d., Indian Northern 1s. 2.91d., Indian Southern 1s. 4.15d., Sumatra 1s. 1.00d.

The latest Colombo average prices available, quoted from the *Weekly Tea Market Report,* 27th April, 1937, of the Colombo Brokers' Association are as follows, in rupee cents per lb.:—High Grown Teas 80 cents, Medium Grown Teas 76 cents, Low Grown Teas 73 cents.

Coffee.—Sourabaya coffee averaged $16.15 to $17.35 per picul in Singapore as compared with $16.19 to $17.19 in March. Palembang fell considerably, averaging from $11.15 to $12.40 per picul as against $13.06 to $14.06 in the previous month.

Spices.

Arecanuts.—The following was the range of average prices per picul of arecanuts in Singapore during April:—Splits $5.50 to $7.25, Red Whole $7.25 to $8.70, Sliced $13.40 to $15.70.

The averages of the Singapore Chamber of Commerce quotations per picul were: Best $7.94, Medium $7.56, Mixed $6.81.

Pepper.—Prices fell still further during April, averages per picul for the month being: Singapore Black $10.12, Singapore White $17.88, Muntok White $18.38.

Nutmegs.—A large volume of business resulted in a sharp advance in price at the commencement of the month from $30 to $35 per picul, but with a slackening of demand prices receded, closing at $31, with an average for the month for both 110's and 80's of $33 per picul as compared with $30 in March.

Mace.—Prices remained unchanged at $105 and $85 per picul respectively for Siouw and Amboina.

Cloves.—Nominal quotations remained unchanged at $40 per picul for both Zanzibar and Amboina.

Cardamoms.—Quotations for green cardamoms per lb. in the Ceylon Chamber of Commerce reports for April fell from Rs. 2.35—Rs. 2.46 to Rs. 1.65—Rs. 2.10, but improved to close at Rs. 2.00—Rs. 2.15.

Miscellaneous.

Derris (*Tuba Root*).—The market continued dull owing to lack of enquiry from the principal consuming countries, in consequence of which prices depreciated considerably about the middle of the month. Roots sold on rotenone content averaged $44 per picul, and roots sold on a basis of ether extract $25 per picul. The March prices were $49 and $32 per picul respectively.

Gambier.—Block was quoted throughout the month at $8 per picul, as compared with an average price of $7.75 in March. No. 1 Cube improved to $17 per picul, averaging $16.75 as against $15.50 in the previous month.

Tapioca.—Prices continued unchanged, and were: Flake Fair $5.50, Seed Pearl $6, Medium Pearl $6.50.

Sago.—Pearl, Small Fair, remained unchanged at $5.50 per picul, while Flour, Sarawak Fair, averaged $3.94 per picul, as compared with $4.06 in March.

Tobacco.—The range of prices for dried leaf was as follows:—1st quality $20 to $40, 2nd quality $15 to $33, 3rd quality $10 to $20. Prices of prepared tobacco were:—$80 to $165, $75 to $100, and $60 to $90.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Kohyei & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2.

GENERAL RICE SUMMARY*

March, 1937.

Malaya.—Imports of foreign rice during March were 42,901 tons,† and exports 10,665 tons, net imports being 32,236 tons as compared with 39,650 tons in 1936¶.

Of the imports during March, 42 per cent. were consigned to Singapore, 20 per cent. to Penang, 7 per cent. to Malacca, 25 per cent. to the Federated Malay States, and 6 per cent. to the Unfederated Malay States. The imports by countries of origin were as follows (in tons, percentages in brackets):—Siam 20,327 (47.4), Burma 21,513 (50.1), French Indo-China 386 (0.9), other countries 675 (1.6).

Of the March exports 79 per cent. were consigned to the Netherlands Indies, and 21 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 6,775 (63.5), Burma 3,642 (34.2), French Indo-China 163 (1.5), parboiled 38 (0.4), local production 47 (0.4).

India and Burma.—Foreign exports during January and February totalled 285,000 tons as compared with 177,000 in 1936, an increase of 61 per cent. Of these, 3.8 per cent. were to the United Kingdom, 5.3 per cent. to the Continent of Europe, 32.3 per cent. to Ceylon, 29.1 per cent. to the Straits Settlements and the Far East, and 29.5 per cent. to other countries. The corresponding percentages in 1936 were 5.1, 10.7, 44.1, 23.7 and 16.4.

Siam.—Exports of rice and rice products from Bangkok during January were 91,991 tons as compared with 139,449 tons in 1936.

According to a report dated the 22nd March regarding the rice crop of Siam for the season 1936-37, the harvested area was 5,576,000 acres with a yield of 3,218,095 tons of padi, as against 7,532,000 acres and 4,689,464 tons for the previous season. The crop yield for the present season is very much lower than the average for the past ten years, which is 4,552,679 tons.

Japan.—Estimated supply and demand of rice for the period March to October are as follows:—

	tons	tons
Stocks 1st March	6,574,000	
Estimated imports from Korea and Formosa ...	1,094,000	7,668,000
Estimated exports	41,000	
,, consumption	6,213,000	6,254,000
,, Stocks 1st November		1,414,000

* Abridged from the Rice Summary for March, 1937, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1936.

French Indo-China.—Entries of padi into Cholon during the first three months of the year totalled 438,339 tons, as compared wiith 513,407 tons in 1936, a decrease of 14.6 per cent. Exports of rice during the same period were 395,674 tons, a decrease of 11.3 per cent. when compared with 445,983 tons in 1936.

The Netherlands Indies.—The latest information available was published in the January Summary.

Ceylon.—Imports during the first quarter of 1937 totalled 142,612 tons as compared with 142,322 tons in 1936. Of these imports 16.2 per cent. were from British India, 72 per cent. from Burma, 0.2 per cent. from the Straits Settlements and 11.6 per cent. from other countries. The corresponding percentages for 1936 were 10.9, 66.7, 0.2 and 22.2.

Europe and America.—Shipments from the East to Europe during the period 1st January to 5th March were 159,414 tons as compared with 82,694 tons in 1936, an increase of 92.8 per cent. Of these shipments 41.7 per cent. were from Burma, 40.2 per cent. from Saigon, 13.4 per cent. from Siam, and 4.7 per cent. from Bengal. The corresponding 1936 percentages were 49.3, 34.4, 13.1 and 3.2.

Shipments for the Levant from the 1st January to the 24th February totalled 2,273 tons, as compared with 2,621 tons in 1936, a decrease of 13.3 per cent. Shipments to Cuba, West Indies and America from 1st January to 2nd March totalled 34,469 tons as compared with 30,025 tons in 1936, an increase of 14.8 per cent.

MALAYAN AGRICULTURAL EXPORTS, FEBRUARY, 1937.

PRODUCT.	Net Exports in Tons				
	Year 1936	Jan.-Feby. 1936	Jan.-Feby. 1937	February 1936	February 1937
Arecanuts ...	26,548	5,819	5,326	2,654	1,239
Coconuts, fresh † ...	114,314†	17,512†	11,441†	7,883†	6,502†
Coconut oil ...	46,507	6,619	5,964	3,489	3,385
Copra ...	76,681	8,933	8,035	1,641	3,760
Gambier, all kinds ...	2,188	415	338	215	212
Copra cake § ...	20,438§	2,271§	2,284§	929	1,187§
Palm kernels ...	4,964	582	1,031	180	437
Palm oil ...	29,296	3,338	5,562	1,728	3,740
Pineapples canned ...	76,403	11,532	12,290	4,744	5,974
Rubber ¶ ...	365,005¶	60,599¶	74,668¶	27,270¶	34,759¶
Sago,—flour ...	6,180	1,301*	3,031	1,640*	1,219
,, —pearl ...	3,319	459	631	182	317
,, —raw	7,484*	1,335*	1,179*	375*	588*
Tapioca,—flake ...	1,535	322	231	157	88
,, —flour ...	2,418*	274*	434*	281*	411*
,, —pearl ...	17,797	1,944	2,644	954	769
Tuba root ...	599	117	140	50	46

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN AGRICULTURAL EXPORTS, MARCH, 1937.

PRODUCT.	Net Exports in Tons				
	Year 1936	Jan.-March 1936	Jan.-March 1937	March 1936	March 1937
Arecanuts ...	26,548	7,893	8,516	2,074	3,190
Coconuts fresh † ...	114,314†	26,364†	17,732†	8,852†	6,291†
Coconut oil ...	46,507	10,398	8,454	3,779	2,490
Copra ...	76,681	17,040	16,124	8,107	8,089
Gambier, all kinds ...	2,188	516	524	101	186
Oil cakes § ...	20,438§	4,232§	3,617§	1,961§	1,333§
Palm kernels ...	4,964	983	1,570	401	539
Palm oil ...	29,296	4,400	9,135	1,062	3,573
Pineapples canned ...	76,403	15,707	19,071	4,175	6,781
Rubber ¶ ...	365,005¶	83,999¶	113,111	23,400¶	38,443
Sago,—flour ...	6,180	458*	6,791	843	3,760
,, —pearl ...	3,319	707	881	248	250
,, —raw ...	7,484*	2,073*	1,935*	738*	756*
Tapioca,—flake ...	1,535	500	323	178	92
,, —flour ...	2,418*	429*	501*	155*	67*
,, —pearl ...	17,797	3,055	3,703	1,111	1,059
Tuba root ...	599	188½	176	71½	36

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1937	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	1,984.8	865.0	360.4	156.0
February ...	1,759.6	1,851.8	323.6	308.7
March ...	1,798.4	1,473.4	358.7	256.1
Total ...	5,542.8	4,190.2	1,042.7	720.8
Total January to March, 1936 ...	4,805.7	1,233.4	805.7	179.8
Total for the year 1936 ...	23,081.2	8,812.3	3,791.0	1,340.7

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST MARCH, 1937.

STATE OR TERRITORY	Estimated Acreages of Tappable Rubber	Actual area tapped during the month acreage	Percentage of (3) to (2)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total area not tapped (5) + (7)	Percentage of (11) to (2)
				ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING (*a*)					
				Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)	Acreage	Percentage of (9) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
STRAITS SETTLEMENTS :—											
Province Wellesley ...	43,813	25,231	57.6	498	1.1	18,084	41.3	390	0.9	18,582	42.4
Malacca ...	120,295	76,230	63.4	663	0.5	43,402	36.1	2,802	2.3	44,065	36.6
Penang Island ...	2,272	958	42.2	803	35.3	511	22.5	106	4.7	1,314	57.8
Singapore Island ...	32,976	19,766	59.9	3,628	11.0	9,582	29.1	301	0.9	13,210	40.1
Total S.S. ...	199,356	122,185	61.3	5,592	2.8	71,579	35.9	3,599	1.8	77,171	38.7
FEDERATED MALAY STATES :—											
Perak ...	292,889	200,578	68.5	5,442	1.8	86,869	29.7	12,201	4.2	92,311	31.5
Selangor ...	337,865	231,502	68.5	7,201	2.1	99,162	29.4	15,243	4.5	106,363	31.5
Negri Sembilan ...	263,259	173,225	65.8	4,951	1.9	85,083	32.3	14,299	5.4	90,034	34.2
Pahang ...	83,613	49,523	59.2	8,213	9.8	25,877	31.0	16,397	19.6	34,090	40.8
Total F.M.S. ...	977,626	654,828	67.0	25,807	2.6	296,991	30.4	58,140	5.9	322,798	33.0
UNFEDERATED MALAY STATES :—											
Johore ...	458,493	325,636	71.0	15,284	3.3	117,573	25.6	35,659	7.8	132,857	28.9
Kedah ...	200,014	119,902	59.9	11,411	5.7	68,701	34.4	13,719	6.9	80,112	40.1
Kelantan ...	27,971	20,858	74.6	403	1.4	6,710	24.0	2,837	10.1	7,113	25.4
Trengganu (*b*) ...	4,817	3,166	65.7	nil	nil	1,651	34.3	100	2.1	1,651	34.3
Perlis (*c*) ...	1,458	541	37.1	nil	nil	917	62.9	177	12.1	917	62.9
Brunei ...	5,513	3,512	63.7	914	16.6	1,087	19.7	901	16.3	2,001	36.3
Total U.M.S. ...	698,266	473,615	67.8	28,012	4.0	196,639	28.2	53,393	7.6	224,651	32.2
Total Malaya ...	1,875,248	1,250,628	66.7	59,411	3.2	565,209	30.1	115,132	6.1	624,620	33.3

Notes :—(*a*) Area out of tapping on estates which have partly ceased tapping refers to areas definitely being rested and includes areas rested under rotational systems, but excludes areas on any tapping round in respect of Perlis only.
(*b*) Registered companies only.
(*c*) Rendered quarterly.

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MARCH, 1937, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January to Mar. 1937		during the month		January to Mar. 1937						
	Ports	Dealers	Estates of 100 acres and over	during the month	January to Mar. 1937	during the month	January to Mar. 1937	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	January to Mar. 1937
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	9,977	14,252	11,580	37,546	7,983	19,764	Nil	Nil	Nil	Nil	13,654	7,487	36,771	16,098	...	8,550	14,079	22	62
Johore ...	...	2,714	5,043	5,452	15,935	4,667	13,090	Nil	110	Nil	325	3,425	7,045	8,609	20,091	...	2,321	5,195	...	...
Kedah ...	...	555	3,454	2,693	8,836	1,088	3,434	Nil	Nil	Nil	Nil	2,071	2,185	6,289	6,365	...	464	3,070	...	...
Perlis ...	...	12	17	10	38	26	66	Nil	Nil	Nil	Nil	Nil	41	Nil	102	...	8	16	...	...
Kelantan ...	...	557	312	330	1,034	412	2,057	Nil	Nil	Nil	Nil	261	755	647	2,323	...	344	261	...	...
Trengganu ...	...	55	50	345	825	173	414	Nil	Nil	Nil	Nil	Nil	518	Nil	1,239	...	55	50	...	...
Brunei ...	...	9	62	62	186	88	249	...	...	...	...	...	149	...	409	...	1	71	...	...
Total Malay States	...	13,889	23,190	20,472	64,400	14,437	39,074	Nil	110	Nil	325	19,411	18,180	52,316	46,627	...	11,743	22,742	22	62
S. SETTLEMENTS :—																				
Malacca ...	...	2,296	1,168	1,223	3,849	756	2,078	Nil		Nil		3,348		8,437		...	1,586	1,234	...	...
Province Wellesley	...	2,994	578	436	1,506	381	798	Nil		Nil		9,907		20,026		...	2,265	547	...	...
Penang ...	2,911	6,498	12	12	37	195	371	3,670	15,531	10,959	42,861		Nil		Nil	3,209	6,392	9	...	...
Singapore ...	7,514	25,209	201	170	476	340	467	15,855		39,468		26,902		58,418		8,834	24,050	177	29	87
Labuan ...	...	18	Nil	Nil	Nil	21	55	54		156		Nil		Nil		...	14	Nil	...	...
Total Straits Settlements ...	10,425	37,015	1,959	1,841	5,868	1,693	3,769	19,579	15,531	50,583	42,861	40,157	Nil	86,881	Nil	12,043	34,307	1,967	29	87
Total Malaya ...	10,425	50,904	25,149	22,313	70,268	16,130	42,843	19,579	15,641	50,583	43,186	59,568	18,180	139,197	46,627	12,043	46,050	24,709	51	149

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	7,637	22,518	6,151	3,644	1,847	146
WET RUBBER	913	1,532	241	222	474	318
TOTAL ...	8,550	24,050	6,392	3,866	2,321	464

TABLE III
FOREIGN EXPORTS

PORTS	For month	January to Mar. 1937
29	30	31
Singapore ...	39,361	91,151
Penang ...	13,982	31,709
Port Swettenham.	6,130	15,814
Malacca ...	95	523
MALAYA ...	95,568	139,197

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January to Mar. 1937
32	33	34
Malay States ...	36,933	96,640
Straits Settlements	3,775	9,423
MALAYA ...	40,708	106,063

Notes :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S and F.M.S., at Singapore on 27th April, 1937.

METEOROLOGICAL SUMMARY, MALAYA, MARCH, 1937.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet				Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						Hrs.	Hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	92.3	72.6	82.5	95	70	87	75	84.7	85.2	13.64	346.5	2.86	20	18	6	4		211.85	6.83	56
Bukit Jeram, Selangor ...	89.8	73.3	81.5	93	72	85	75	86.2	87.1	4.05	102.9	2.12	13	10	5	1		249.70	8.05	67
Sitiawan, Perak ...	90.5	74.1	82.3	94	71	87	76	84.8	84.7	7.38	187.5	1.54	13	10	1			238.55	7.69	64
Temerloh, Pahang ...	92.5	73.2	82.9	95	69	90	76	87.3	86.3	6.72	170.7	1.66	12	10	2	4	1	247.05	7.97	66
Kuala Lipis, Pahang ...	93.2	71.7	82.5	95	69	90	75	85.3	85.1	7.95	201.9	2.40	11	10	3	20	1	224.25	7.23	60
Kuala Pahang, Pahang ...	87.7	75.3	81.5	90	72	84	81	88.5	87.3	3.95	100.3	2.97	9	8			1	275.20	8.88	73
Kallang Aerodrome, S'pore ...	87.9	75.8	81.9	92	72	85	78	83.2	83.8	6.93	176.0	2.31	13	9	5			232.70	7.51	62
Butterworth, Province Wellesley ...	89.6	75.2	82.4	91	73	87	77	87.6	86.1	4.58	116.3	1.35	11	7	2			264.30	8.53	71
Bayan Lepas Aerodrome Penang ...	89.5	75.0	82.3	92	72	86	77	85.5	85.5	3.18	80.8	0.70	16	14	5			232.45	7.50	63
Bukit China, Malacca ...	88.0	74.4	81.2	92	72	84	76	85.1	85.3	7.09	180.1	1.91	11	11	4		2	228.65	7.37	61
Kluang, Johore ...	91.4	71.9	81.7	95	70	83	75	82.8	82.6	8.82	224.0	2.62	11	10	5	4		223.85	7.22	60
Bukit Lalang, Mersing, Johore	86.6	72.5	79.5	91	69	82	79	82.3	81.1	0.69	17.5	0.19	9	6				237.65	7.67	63
Alor Star, Kedah ...	94.4	73.9	84.1	98	72	90	76	88.7	88.5	4.83	122.7	2.13	17	14	3	1		265.45	8.56	71
Kota Bahru, Kelantan ...	90.9	71.8	81.3	93	68	88	75	84.1	83.8	1.16	29.5	1.00	3	3		3		287.75	9.28	77
Kuala Trengganu, Trengganu	88.9	72.8	80.9	92	70	87	75	86.3	85.2	1.03	26.2	0.84	7	3	1	4		290.40	9.37	77
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	75.9	63.4	69.7	81	60	70	65	73.3	73.0	6.38	162.1	1.25	19	15		12	1	170.50	5.50	45
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	74.9	56.1	65.5	79	50	72	60	70.3	69.8	6.29	159.8	1.24	23	19	1			153.95	4.97	41
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	74.2	60.5	67.3	79	58	71	69			6.04	153.4	1.21	23	18	1			169.10	5.45	45

Compiled from Returns supplied by the Meteorological Branch, Malaya.